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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 5 & 6 Science: Transformations of energy**

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| **Big Ideas:**   * Energy sources are either renewable or non-renewable. (Overall expectation 3) * Energy can neither be created nor destroyed, but it can be transformed. (Overall expectations 2 and 3) * Choices about using energy and resources have both immediate and long-term impacts. (Overall expectation 1) * Conservation (reducing our use of energy and resources) is one way of reducing the impacts of using energy and resources. (Overall expectation 1)   **Overall Curriculum Expectations :**   * Analyse the immediate and long-term effects of energy and resource use on society and the environment, and evaluate options for conserving energy and resources; * Investigate energy transformation and conservation; * Demonstrate an understanding of the various forms and sources of energy and the ways in which energy can be transformed and conserved. | |
| **Learning Goals**   * Understand different forms and sources of energy * Make a device that is capable of transforming electric energy into sound energy in order to solve a technological problem * Communicate their results | **Success Criteria :**   * Identify forms of energy * Explain how energy is stored and transformed * Recognize that energy cannot be create nor destroyed, but that it can be transformed from one form to another * Make a plan to build a device * Recognize different transformations of energy that occur within devices * Make a device while following success criteria * Explain how the transformed energy is involved in solving the defined problem * Explain how to minimize loss of energy in order to improve devices |
| **Lesson Overview :**  **Throughout this lesson, students will:**   * Explore various forms of energy * Explore transformations of energy from one form to another * Use appropriate Science terminology * Explore the effects of loss of energy * Discuss the consequences of overconsumption of energy on the environment * Follow the technological problem-solving skills continuum | |
| **Materials and technology to be used:**   * Cardboard * Scissors * Tape * Paperclips * Conductive wires * Glue sticks * Glue guns * A bell * A battery or other energy source * Paint * Green Screen * iPads | |
| **Accommodations/Modifications :**   * Form heterogeneous (mixed ability) groups keeping in mind different learning difficulties * Over the course of the project, constantly remind students to use specialized vocabulary * Students will conduct research before deciding which device to make | |
| **MINDS ON:** | |
| During this phase, the teacher will :   * Show students a video that illustrates how electricity is produced, along with how devices use electricity, and how energy is transformed from one form to another * Discuss key ideas in the subject of energy conservation pertaining to space travel  1. Sources of energy and forms of energy 2. Transformation of energy 3. The repercussions of burning fossil fuels 4. Conservation of energy  * Ask students questions to ensure their prior knowledge is sufficient for the task at hand (transformation of energy forms, conservation, etc.) | During this phase, the students will :   * Do a think-pair-share to brainstorm ideas regarding energy forms and transformations * Answer teacher’s questions |
| **Describe how you will introduce the learning activity to your students. What key questions will you ask? How will you gather diagnostic or formative data about the students’ current levels of understanding? How will students be grouped? How will materials be distributed?**   * Introduce the challenge and give students a “roadmap” * Have students conduct research to decide which device they want to make * Next they have to make a plan (or blueprint) of their prototype, along with a list of materials needed to accomplish their task (the teacher can build materials or the students can bring what they need from home) * **Diagnostic** assessment will be collected while students think-pair-share and fill out the KWL chart (teacher makes anecdotal notes) | |
| **ACTION:** | |
| During this phase, the teacher will :   * Review the steps in the technological problem-solving process * Discuss important safety considerations while working with electricity * Have students conduct experiments (that they have come up with) to identify transformations of energy * Invite students to make their prototype devices (which ultimately showcases what they have learned regarding energy transformations) while they follow the “roadmap” (their plan) | During this phase, the students will :   * Follow safety considerations laid out by the teacher with respect to tools, materials, electricity, etc. * Explain their thinking in terms of what they are making, and choose their partner wisely * Follow the “roadmap” they’ve created |
| **Describe the task(s) in which your students will be engaged. What misconceptions or difficulties do you think they might experience? How will they demonstrate their understanding of the concept? How will you gather your assessment data (e.g., checklist, anecdotal records)? What extension activities will you provide?**   * Posing clarifying questions to elicit students’ thinking * Clarify the difference between sources of energy and forms of energy * Comparing and choosing the best source of energy for their project * Presentation of the final product according to the choice of format of the students * Final product may be assessed using a rubric or checklist | |
| **CONSOLIDATION: Réflexion et Connection** | |
| During this phase, the teacher will :   * Ask students to fill-in their science journals constantly, using the following prompts:   \*What I learned  \* What was difficult  \* What was easy  \*How can I improve my device? \* How could I have minimized energy loss in my device? | During this phase, the students will :   * Share their learning * Justify and explain their thinking * Reflect on their learning * Fill out their science journal |
| **How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)? What key questions will you ask during the debriefing?**   * Students will receive a presentation checklist according to the format of presentation they selected (written earlier on their roadmap) * During the Maker Faire, students will present the challenge they sought to accomplish, explain the steps taken during the “making” phase, as well as important safety considerations they took into account, in addition to how their device works * They will propose different energy sources they could have used for their device, explaining the advantages of each * They will present the difficulties they encountered while making, along with the ways they succeeded in following their roadmap | |